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# USSR Report

## ENERGY

No. 65

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## DEVELOPMENT OF SOVIET FUEL-POWER BASE REITERATED

Moscow IZVESTIYA in Russian 21 Apr 81 p 2

[Article by Yu. Grin'ko: "'...Plus the Electrification of the Entire Country'"]

[Text] It is so habitual--you flip a switch, a lathe comes on; you push a button, the television screen lights up; you drop a coin into the automatic cashier on the subway and a swift train comes to your service. In the multifaceted world of things that surround us, those things which are made without the aid of electricity are becoming a noticeable rarity. All the creative activity of man, his life and daily existence, are at present bound most intimately to electric power. Meanwhile, what delight, what astonishment the light of a simple electric bulb caused in people a mere six decades ago!

In the fall of 1920 the inhabitants of the village of Kashino near Moscow sent a letter to V. I. Lenin. "On the 14th of this November," they informed him, "the debut of electric lighting will take place in the village of Kashino. We most humbly ask you to attend and to share in that joy which we feel when we see electric lighting in our peasant huts, something the peasants dared not think of under the tsars. Your presence is desired very much." Vladimir Il'ich, under whose immediate direction the State Commission for the Electrification of Russia was developed and who called this plan the party's second program, responded, of course, to this invitation, and the bulb was lit in the Russian village.

Subsequently, the Soviet people carried out Lenin's behest regarding the leading role of electrification in the creation of a material-technical base for the communist society. Through the selfless labor of millions, a powerful and highly efficient fuel and power complex was created in our country in the briefest of historical periods of time. Providing almost one fifth of the world's production of all power resources, the Soviet Union essentially is outstripping the largest capitalist countries with respect to the absolute growth achieved. In recent years, while retaining our leading position in the mining of coal, we also moved into first place in petroleum production. We are rapidly approaching first place in gas production. Our electric power industry occupies leading positions in the world with respect to the individual outputs of generating sets, the level of power system development and the scale of district heating. Here is a base upon which we managed to increase the power available per worker in our country by a factor of 1.5 in only the 10th Five-Year Plan!

The gains attained cause well-grounded pride. Does this mean, however, that we can be content with our achievements? Of course not. History shows that the technical level and caliber of material production rely most directly upon the provision of all types of power to the national economy.

What, then, has brought about this situation in which the problem of improving the fuel and power balance and the task of bettering its structure is becoming all the more urgent? In order to explain the essence of the matter, one may not do without a brief excursion into the past.

As is well known, the past decade was marked by considerable growth in the scope of the national economy, with (and this is of fundamental importance) a course being taken toward the intensification of the economy and an increase in its efficiency and quality. It is natural that the power production program was also structured based on the priority of the development of the most economical resources--oil and gas. As a result, the structure of consumption of energy underwent essential changes: the share of oil and natural gas in the fuel and power balance increased and has already exceeded 70 percent. Cheap, high-quality forms of fuel began to compete seriously with electric power. Metallurgists and machine builders in power-intensive production processes began to prefer natural gas, while workers in transportation, construction and agriculture expressed a preference for liquid fuel.

The economic strategy of those years played a tremendously positive role. It made it possible to carry out a technical re-equipping of the economy on the basis of the mechanization and automation of production processes and the introduction of up-to-date technology. This orientation toward high-quality fuel, however, entailed unwanted consequences: a lag began to show in the development of the coal industry along with a slowdown in the rate of electrification.

Other negative effects made themselves known. The high economy of oil and gas over the course of a number of years resulted from the preferred utilization of European reserves and the nearness of the power resources to the sources of the demand. Year by year, however, their center of production moved ever farther into Siberia. The severe climate, lack of roads and more difficult geological conditions sharply increased both the overall as well as the specific capital investment. The introduction of new industrial plants more frequently began to "work" not on the increase of new output but on making up for plants that left the ranks of those operational.

These tendencies testifying to the necessity for considerable correction in the development of the fuel and power complex were noted in due time. The resolutions of the 25th and 26th party congresses established the basic conditions of the new energy policy. In them, emphasis was placed on the accelerated development of nuclear power engineering, the coal industry and hydroelectric power engineering with careful utilization of nonrenewable resources such as oil and gas, as well as on the conservation of fuel and power. The 11th Five-Year Plan is the first step in the realization of the USSR's energy program.

The "Basic Directions for the Economic and Social Development of the USSR for the Years 1981-1985 and for the Period to 1990," adopted by the 26th CPSU Congress, call for the production of electric power to be brought up to 1.55 to 1.6 billion

kWh by the end of the five-year plan, the production of oil (with gaseous condensate) to 620 to 654 billion tons, gas to 600 to 640 billion $m^3$ and coal to 770 to 800 million tons. This increase with respect to the majority of items is very considerable. However, not only the quantitative progress is important--profound qualitative transformations will also take place in the fuel and power balance.

The substitution for oil in all major spheres of energy resource consumption is a leading principle in the development of a new structure in the fuel and power balance. Today this most precious raw material for chemical and microbiological production [the supplies of which are far from limitless, the costs for which continuously grow] makes up almost half of the fuel and power balance. "We must reduce oil's share as a fuel," pointed out Comrade L. I. Brezhnev, "we must replace it with gas and coal and develop atomic power engineering more rapidly, including fast reactors."

The new five-year plan is primarily characterized by the accelerated growth of atomic power engineering. We plan to increase the power generation two-fold at AES's by 1985, bringing it up to 220 to 225 billion kW of power output.

It is noteworthy that both operational as well as newly built AES's are basically concentrated in the European sector of the Soviet Union. Is there an element of chance in this? On the contrary--it is a result of careful calculation. This is where two thirds of the population live and where a considerable portion of the total social production is carried out. It is less advantageous economically to deliver fuel here from the east than it is to construct an AES. The unit cost of electric power generated on nuclear fuel is already comparable with the same indicator at thermal stations. New equipment of great individual capacity makes it possible to achieve this. The Zaporozhskaya, Rostov, Ignalina, Balakovo, Southern Ukraine, Smolensk, Kalininskaya and Khmel'nik AES's as well as other new construction projects are fitted out with power units from one to one and a half million kW.

Nuclear fuel will also find application in centralized heating supply for large cities--construction will begin on heating supply atomic stations in Gor'kiy and Voronezh and on an atomic TETs in Odessa. One such boiler plant is fully capable of supplying a city of 400,000 with heat, freeing approximately 800,000 tons of fossil fuel annually.

A second structural shift toward power production which does not require fossil fuel is characterized by a broader application of renewable resources. Power generation at GES's by the end of the five-year period will reach approximately the same level at AES's. The increase in output from hydraulic power is planned for 12.3 million kW.

Think it over, reader. One of the first Soviet electric power stations, the Volkhov GES, considered to be very large for its time, had an output of 58,000 kW. It appears that in the next five years the hydroelectric power industry will accrue capacities equal to more than 200(') Volkhov electric power stations.

The involvement of river power in the economy depends directly upon the conditions in the regions. For example, GES's take on the role of regulators of power system operation in the central regions of the country's European sector and in the Urals

where the individual outputs of commissioned power units continually rise but the electric power load curves are very irregular during the course of the day. Moreover, there are hydroaccumulating power stations here whose purpose is to collect the "excess" power of atomic and thermal stations during hours of low loads in the networks and transmit this power as needed to consumers at other times of day.

The power potential of rivers will aid in the further development of the eastern regions of the motherland, in the establishment of large-scale territorial production complexes in Siberia and in the Far East and in the development there of the energy-intensive plants of ferrous and nonferrous metallurgy and the chemical and cellulose-paper industry. The GES's in Central Asia will provide a new impetus for the development of industrial enterprises and will regulate river flows, redistributing them for irrigation.

For all the significance of AES's and GES's, fossil-fuel fired thermal stations have been and remain the basis of our country's power potential. They provide the economy with more than three quarters of all its electric power. Since gas and fuel oil make up more than half the fuel consumed by these stations, the thermal power industry has no task more important than the reduction of the consumption of petroleum products as boiler and furnace fuel to a minimum.

It would seem that the solution to this situation is obvious--replace fuel oil with coal, seeing that coal reserves are enormous. This, however, is not so simple. The steam generators of powerful generating sets in a considerable portion of the stations can operate only on fuel oil or natural gas. To refit them to burn coal is a difficult matter, expensive and lengthy. It is cheaper and quicker to shift thermal stations to gas. This is the very method we have chosen. Moreover, it was decided that several large-scale GRES's specially designed to utilize natural and casing-head gas would be built in Tyumenskaya Oblast during the next five-year plan.

A new stage in the development of thermal power production is associated with the accelerated construction of unique thermal stations which utilize cheap coal from the Ekibastuz and Kansko-Achinsk basins. It was decided that five GRES's with a combined output of 20 million kW be built in Ekibastuz. Three 500,000-kW power units are already in operation here and a fourth is being readied for start-up. Work has begun on the GRES-2. Plans have been made for even larger thermal electric power stations, for the Kansko-Achinsk fuel and power complex. At the first of these, the Berezovskaya, commissioning will take place during the 11th Five-Year Plan.

The electric power obtained from these regions is sent to the Urals and the country's central region along super-high voltage electric transmission lines which have no equal in the world. The Basic Directions for the new five-year plan envisage the commissioning of the first phase of electric power transmission along the 1,500-kV Ekibastuz-Center direct-current line and along the 1,150-kV Ekibastuz-Urals alternating-current line. The first transmission line supports have already been put in place.

Comrade L. I. Brezhnev has called the rapid expansion of Siberian gas production a task of paramount economic and political importance. Efforts are being concen-

trated primarily on the development of the Urengoy deposits at a rapid pace. It is distinguished by such reserves that over the course of a prolonged period of time it could provide for all of our country's needs. The aim of the party's Central Committee adopted by the 26th CPSU Congress: the production of gas and oil in western Siberia and their transport to the country's European sector must be made the most important factors in the power program of the 11th and even the 12th Five-Year Plans.

The scope of the work confronting us is immense. We must construct a complete gas production base in western Siberia over the next five years. This base must have an output exceeding the output of a modern facility by a factor of 2.5. We must utilize an amount of capital investment greater than that from the last three five-year plans, taken together. An important condition for success here is the extensive application of a new class of production equipment of great unit capacity and high efficiency. Modern automated modular units for the preparation of the gas and the gas condensate will find application in oilfields, as will high-efficiency full-head pumps. The volume of construction work on super-long gas lines will be increased by a factor of 1.5.

Whether it is a question of the reserves of our fuel and power resources or their production volumes, we will have to use truly astronomical figures. The fact that the cost to the economy for each unit of power resources will increase even more is indisputable. Consequently, there arises the necessity to increase the complexity of their utilization--when extracted from the ground and during their subsequent transformation, distribution and consumption. "The urgency of these tasks," emphasized Comrade L. I. Brezhnev, "is associated with the fact that this is a question of nonrenewable riches. We bear responsibility for their proper and thrifty utilization not only before the present generation but before the future generations as well. No one has the right to forget this."

From the Basic Directions it follows that industrial production in the 11th Five-Year Plan should grow by 26 to 28 percent, while the generation of electric power should increase by 20 to 24 percent. Therefore, the economy of fuel and energy will henceforth remain a most important State affair. Just as before, the thrifty expenditure of fuel and power resources will remain the focus of all our economic activity.

In comparison with 1980, the savings for 1985 should amount to 160 to 170 million tons of conventional fuel, including half that amount due to reduced rates of consumption. A proprietary attitude toward social wealth, the skill to utilize everything we have fully and expeditiously--toward this must be directed the policies of engineering and capital investment and the system of accountable planning indicators. The party congress approved this conclusion as one of the main principles of the economic strategy for the upcoming period.

The motherland's fuel and power complex reliably serves and will serve the dynamic growth of our economy. To improve and strengthen it is an important task for each collective and each Soviet individual. For this reason, the slogan advanced by V. I. Lenin will retain permanent significance in the future as well: "Communism is the Soviet government plus the electrification of the entire country."

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ELECTRIC POWER

## SCIENTIFIC, TECHNICAL PROGRESS IN POWER MACHINE BUILDING

Moscow PLANOVOYE KHOZYAYSTVO in Russian No 5, May 81 pp 3-14

/Article by USSR Minister of Power Machine Building V. Krotov: "Power Machine Building and Scientific and Technical Progress"/

/Text/ In the Accountability Report to the 26th Party Congress General Secretary of the CPSU Central Committee L. I. Brezhnev once again emphasized the need for the immediate solution of the fuel and energy problem of our country, first of all the further intensive development of nuclear electric power engineering. The tendency for the greater and greater increase of the demand for energy, especially its universal types--electric power and thermal energy--is now typical of the USSR national economy. This trend is one of the manifestations of the qualitative structural shifts taking place in the USSR national economy, including in the means of achieving an effective end result in all the sectors of the domestic economy.

"An indisputable prerequisite of the solution of all national economic problems--both production and social--is the development of heavy industry," L. I. Brezhnev said at the 26th CPSU Congress. "This especially concerns its base sectors, first of all the /fuel and power/ /in boldface/ sectors. I will not mention figures--they are known to you. I would merely like to emphasize that the problem of improving the structure of the fuel and power balance is becoming more and more urgent. The share of petroleum as a fuel must be reduced, it must be replaced by gas and coal, nuclear power engineering, including fast reactors, must be developed more rapidly. And, of course, life requires the continuation of the search for fundamentally new sources of energy, including the development of the principles of thermonuclear power engineering."[1]

Thus, the 26th CPSU Congress set a two in one task: to expand the generation of electric power and heat for meeting the demands of industry, agriculture and the personal needs of the population and to change the structure of the fuel and power balance. It is a large-scale and long-range task. It reflects both the assessment of the demands of today and the concern about the future generations of Soviet people. In conformity with this task in our country fuel and energy resources are being used purposefully in all the sectors on the national economy, structural changes in the means and methods of generating electric power and thermal energy are being achieved on the basis of promising scientific developments, which is setting for power machine builders new, more and more complicated problems.

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1. PRAVDA, 24 February 1981.

In 1985 it is envisaged to increase the generation of electric power in our country to 1.55-1.6 trillion kWh and to continue the development of thermal, hydroelectric and especially nuclear electric power engineering. The output of electric power at nuclear power stations will reach a level which is approximately equal to the volume of its output at domestic hydroelectric power stations. The regional distribution of AES's, the construction of which as before is being planned primarily in the European part of the USSR, where the main industrial potential of the country is concentrated, will remain unchanged.

Of course, the solution of such an important state problem is directly connected with the expansion and improvement of the machine building base, and first of all with the leading development of power machine building, especially sectorial high quality metallurgy, and with the utmost acceleration of scientific and technical progress. In their speeches at the 26th CPSU Congress General Secretary of the CPSU Central Committee L. I. Brezhnev and Chairman of the USSR Council of Ministers N. A. Tikhonov emphasized the special role which machine building is playing in the strengthening of the fuel and power complex both in the European part of the USSR and to the east of the Urals, including in the development of the coals of the Kansk-Achinsk, Ekibastuz and Kuznetsk basins, as well as petroleum, gas and ore deposits.

At present the associations and plants of the Ministry of Power Machine Building are supplying highly productive and operationally reliable basic and component equipment for thermal, nuclear, hydroelectric and gas turbine electric power stations, gas pumping units for the compressor stations of main gas pipelines, compressor, delivery, power technology and heat recovery equipment for the chemical and petroleum refining industry, nonferrous and ferrous metallurgy, agro-industrial complexes, household boiler equipment and other products. In recent years new blocks have been put into operation at the Novovoronezhskaya, Kol'skaya, Rovenskaya, Leningradskaya, Kurskaya, Chernobyl'skaya, Armyanskaya, Bilibinskaya and Beloyarskaya AES's. The Sayano-Shushenskaya, Kurpsayskaya, Nizhnekamskaya, Cheboksarskaya, Nurekskaya, Ust'-Ilimskaya and other GES's are providing industry and the population with electric power. The construction of the Zaporozhskaya and Uglegorskaya thermal electric power stations, the most powerful in Europe, and the Reftinskaya GRES, the most powerful in the Urals, has been completed.

During the 10th Five-Year Plan the output of hydraulic turbines by enterprises of the sector increased by 26 percent. Five of the most powerful radial-axial turbines in the world with a capacity of 640,000 kW each were produced and sent to the Sayano-Shushenskaya GES. The largest domestic propeller turbines with a unit capacity of 119,000 kW were built by the Khar'kovskiy turbinnyy zavod imeni S. M. Kirova Turbine Building Production Association for equipping the second section of the Dneprovskaya GES imeni V. I. Lenin.

During the 10th Five-Year Plan the output of steam turbines by enterprises of the sector increased by 20 percent and of boilers with a capacity in excess of 10 tons of steam per hour by 9 percent. The series production of power blocks for GRES's with a unit capacity of 500,000 and 800,000 kW, as well as of central heating turbines with a capacity of 250,000 kW, which have no analogs in world heat and power engineering, was assimilated. The group of developers of a unique central heating turbine was awarded the honorary title of USSR State Prize winners.

During the past five-year plan the series production of equipment for power blocks with a unit capacity of 500 and 800 MW was assimilated by the boiler making enterprises of the Ministry of Power Machine Building. The Leningradskiy Metallicheskiy zavod Turbine Building Production Association on the basis of series-produced machines with a unit capacity of 500,000 and 800,000 kW developed and delivered to the Kostromskaya GRES the prototype of a single-shaft steam turbine with a capacity of 1.2 million kW. A single-shell gas-tight boiler with a capacity of 3,950 tons of steam per hour was built for the first time for this thermal electric power station by the Krasnyy kotel'shchik Production Association (Tagangor). For the purpose of meeting the demands of the developing gas industry the enterprises of the Ministry of Power Machine Building increased the production of gas turbines by 1.6-fold.

The Main Directions of USSR National Economic Development for 1976-1980 stipulated: to introduce at nuclear electric power stations new capacities in the amount of 13-15 million kW; to begin the series production of reactor equipment for breeder-reactor AES's and of turbo-units for them with a unit capacity of not less than 1 million kW; to carry out the development of complete sets of equipment and to begin their output for the power blocks of AES's with a unit capacity of up to 1.5 million kW; to begin the development and introduction of breeder-reactor power blocks. Thus, the 10th Five-Year Plan was for the power machine builders a period of the quantitative growth and qualitative development of nuclear power machine building. During 1976-1980 the production of reactors with respect to capacity increased as against the Ninth Five-Year Plan more than twofold, 23 reactors with a total capacity in excess of 15.8 million kW were sent to clients. All this makes it possible to declare, as was noted in the Accountability Report at the 26th party congress, that a new sector--nuclear power machine building--has been established in the country.

Moreover, during the 10th Five-Year Plan the enterprises of the sector assimilated the production of power plants of AES's with a large unit capacity. A VVER-1000 main equipment package was delivered for the fifth block of the Novovoronezhskaya AES with turbines with a unit capacity of 500,000 kW at 1,500 rpm, which has been placed into operation. The national economic impact from the operation of this block, which was calculated on the basis of the comparison of the new equipment with the corresponding VVER-440 equipment, exceeded 8 million rubles.

The power machine builders also coped with the delivery of equipment for a power block with a BN-600 breeder reactor for the Beloyarskaya AES. Complex technical problems were solved in the process of assimilating the production of these unique items, which have no analogs in world practice. Specialized production capacities, which are furnished with modern processing equipment, were created; a new processing method was adopted; complicated large accessories were developed and produced.

For furnishing nuclear electric power stations with efficient and, what is the main thing, promising steam turbines the collective of the Leningradskiy Metallicheskiy zavod Association has launched design operations and has begun the preproduction for the output of a turbine with a capacity of 1 million kW at 3,000 rpm.

Extensive deliveries of power equipment in accordance with international obligations, particularly for the nuclear electric power stations of the GDR, the CSSR, Bulgaria, Hungary, as well as Finland, were made during the 10th Five-Year Plan.

The high rate of development of nuclear power machine building in the USSR is the result of the implementation of a set of organizational and technical measures. The planning of this most important direction of power machine building has been improved and its management has been put in good order. The influence of the economic mechanism, including the indicator of the standard net output, on the increase of production efficiency and labor quality at each workplace is being intensified. The production capacities are being expanded. The construction of Atommash and its production of the first vessel of the 1 million kW Donskoy reactor were events of statewide importance. Fundamentally new technological processes are being assimilated and existing ones are being improved.

A system of management, planning, financing and economic stimulation, including of operations on new technology, has been adopted in the sector. The role of the five-year plan as the main form of economic management, the development of a set of long-term stable indicators of the use of material resources and economic stimulation, the orientation of the system of indicators of the national economic plan toward the achievement of the end results has increased considerably.

In spite of the wide scope of deliveries and the large list of items, electric power engineering remains the main consumer of the output of power machine building. At the same time its technical level, which is determined by the specific consumption of fuel, the operational reliability and the utilization ratio of the installed capacity, is increasing with each five-year plan. Thus, technical progress in power machine building and the improvement of the operation of boiler units and steam turbines were responsible for the substantial decrease during the past 10 years of the specific consumption of fuel at the electric power stations of the USSR Ministry of Power and Electrification: from 366 to 328 g/kWh. With reference to the total volume of electric power generation in our country this means a fuel saving in the amount of 40 million tons of conventional fuel a year.

The utilization ratio of the installed capacity of thermal electric power stations increased on the average by 10 percent, which is making it possible to increase the generation of electric power without placing new capacities into operation. This also confirmed the correctness of the choice as series-produced equipment of power equipment with a unit capacity of 500,000 and 800,000 kW for thermal electric power stations, 500,000 and 1 million kW for AES's, 180,000 and 250,000 kW for TETs's which burn organic fuel and 500,000 kW for nuclear TETs's.

At the same time at the present stage of the development of electric power engineering and power machine building along with major achievements there are also some difficulties which are connected with the problems of developing more advanced power equipment. They require efficiency and a broad creative approach from the specialists and production collectives of not only the Ministry of Power Machine Building, but also the related sectors which are participating in the implementation of the all-union power program. As applied to the power system of the European part of the country, where three-fourths of the installed capacity of USSR electric power stations are now concentrated, these problems are characterized by three most important factors: the radical reorientation of power engineering toward the use of atomic fuel, including for the generation of heat; the limitation of the reserves of high quality solid fuel and the need connected with this for the inclusion in the fuel balance of low-grade fuels, the main reserves of which are found in the eastern regions; the difficulties of covering the peak electric

power loads which are caused by the predominance in the power systems of main power plants which operate in a base mode.

As to the decrease of the demand for organic fuel for the needs of power engineering of the European part of the USSR, it is already being accomplished. Nuclear fuel is being actively included in the fuel balance. An extensive scale of the placement into operation of power plants at AES's with a unit capacity of 1-1.5 million kW and at breeder-reactor AES's with a unit capacity of 800,000 and 1.6 million kW is outlined by the Main Directions of USSR Economic and Social Development for 1981-1985 and the Period to 1990. However, the lack of interdepartmental coordination on a number of important problems of scientific and technical progress, including the development and introduction at series-produced AES's of vertical steam generators, technologically efficient main circulating pumps, equipment of the unified heating system and other new, advanced design solutions, is hampering progress in this promising direction.

An advanced design of a vertical steam generator has been developed by the scientific research organizations of the Ministry of Power Machine Building for an arrangement with vessel reactors. As compared with the horizontal steam generators now being used it considerably increases the operating reliability, as well as decreases the metal content of this large vessel item. The use of vertical steam generators for power plants with water-cooled water-moderated power reactors substantially simplifies the introduction of a standardized cycle diagram of AES's. On its part, such a diagram affords the opportunity for the extensive standardization of the component equipment, which is of great importance when organizing its series production, as well as promises an enormous economic impact and reduces the consumption of rolled metal.

The idea of a standard cycle diagram of AES's has been recognized as urgent first of all because the placement into operation of new capacities at nuclear electric power stations in the total amount of 24-25 million kW is called for during the 11th Five-Year Plan. With allowance made for the production of equipment for AES's for export this amount will be 38 million kW, that is, the rate of its output (with respect to capacity) will increase 2.3-fold. This program will require the efforts of power machine builders, metallurgists, instrument makers--everyone who is involved in the supply of components for AES's. However, its implementation as in the past entails a number of artificial difficulties and first of all the fact that to this day there have been disputes: what kind of equipment is to be used in such diagrams--traditional or new?

Of course, experience in operating vertical steam generators and in elaborating standard diagrams of the arrangement of the equipment of AES's has not yet been gained in our country. But whereas the development of standardized diagrams has already begun, the question of using a vertical steam generator has never been solved. Hence, the experience of its industrial operation will not appear soon, the design and technological development of this large item will be postponed. The implementation of the outlined program of the intensive development of nuclear electric power engineering of the country requires the quickest possible overcoming of departmental interests and the immediate pooling of the creative efforts of all the specialized organizations involved in this matter in order to solve successfully and in a short time this statewide problem. And the sooner a thorough understanding of the need to pool all efforts is reached, the more our national economy stands to gain economically.

During the years of the 10th Five-Year Plan much was done on developing unique capacities for the production of nuclear power equipment. However, not all of the problems were completely solved. At present the utmost development of high quality sectorial metallurgy, which governs the success of the matter, and of the capacities of individual plants, which are necessary for the production of various types of component equipment, is extremely important. Here there should be taken into account the very fast growth rate of the production of equipment for AES's during the years of both the 11th and the 12th Five-Year Plans. Moreover, it is necessary also to take into account the lengthy production cycle of equipment for AES's, and its especially difficult installation, the adjustment of AES's and the bringing of them up to the rated capacity. And this means that, in order to produce the equipment for the placement of AES's into operation during the first year of the 12th Five-Year Plan, it is necessary to begin its production at least in 1983. Of course, it is necessary to have the capacities for such a production volume of equipment at least a year earlier. Obviously, when drafting and amending the five-year and annual plans USSR Gosplan should take into account all these peculiarities of the development of nuclear power machine building.

An increase of the unit capacities of turbo-units of AES's, which double approximately every 10 years, is typical of modern power engineering. Having assimilated the series production of steam turbines with a unit capacity of 500,000 kW, which are designed for nuclear electric power stations, the power machine builders shipped for the first block of the Yuzhno-Ukrainskaya AES a steam turbine with a capacity of 1 million kW. The Leningraders are designing a high-speed machine of the same capacity, which will be put into series production, for nuclear power plants with water-cooled water-moderated power reactors. Component equipment is being developed at the same time.

Thus, the scientific research and design and technological organizations and enterprises of the Ministry of Power Machine Building are working on a scientific and technical reserve for the long-range future. The Main Directions of USSR Economic and Social Development for 1981-1985 and the Period to 1990 have set for the power machine builders the task: to increase the production of nuclear reactors with a capacity of 1-1.5 million kW, to work out new designs of power blocks with breeder reactors with a capacity of 800,000-1,600,000 kW.

The solution of this problem requires the greater coordination of the actions of all the concerned ministries and departments. The USSR State Committee for Science and Technology could make a significant contribution to the organization of their efficient cooperation. It is necessary to accomplish this now, since the development cycle of power equipment of new generations comes to at least 10 years, including the development of new technical and production solutions. As many years of practical experience show, there is no alternative to this means.

The need also arose long ago to clarify the question of which is economically more advantageous--slow-speed or high-speed turbines, which are designed for making up complete sets of equipment for the power blocks of AES's. The specialists of the Ministry of Power Machine Building came to the conclusion that high-speed machines are more promising in this respect. Their extensive introduction will make it possible to decrease the metal content to two-thirds, to decrease the size and increase the accessibility of power blocks for repair, to reduce substantially the labor expenditures on their maintenance, to standardize the blading, to use at

different enterprises identical equipment accessories and, consequently, to reduce the production costs. In the end the economic efficiency of high-speed turbines for AES's is obvious.

Indeed, the client has already made certain outlays for the preparation of the plans of the machine rooms with slow-speed turbines. The use of high-speed turbines will require the revision of these plans, which will lead to additional outlays. But if they are taken into account from the standpoint of the long-term national economic impact, they will unquestionably turn into a direct advantage for the economy as a whole. Therefore, departmental interests should give way to statewide interests. It is impossible not take take into account what material resources and how much time will be required to repair low-speed turbines after 15-20 years. All this can cause the national economy great losses.

Turning to the urgent problems of the development of new types of power equipment for electric power stations which run on organic fuel, it should be noted that the stepping up of fuel production in the European regions of the country or its maintenance at the previous level leads in the case of the limitation of local fuel resources to a sharp deterioriation of the quality of the fuel itself. From 1970 to 1978 the heat of combustion of Donets and Moscow coals decreased on the average by 10-13 percent, while their ash content increased. At some thermal electric power stations the heat of combustion decreased by one-third to one-half. The shortage of fuel of the main types was offset by deliveries of low-grade coals of various types, the number of which at a number of electric power stations came to 10.

Such a situation leads to the occurrence of substantial difficulties in the operation of power equipment and decreases its reliability. The nominal output of the steam generators and the efficiency of the furnace equipment, which is not designed for such heavy-duty conditions, are threatened. The extensive adding of fuel oil or gas to the fuel for achieving the necessary capacity of the power blocks and the steadiness of combustion in the furnace units of coal dust TETs's leads to an increase of the demand for this scarce fuel, as well as to additional losses from incomplete combustion and to the damage of the burners and the heating surfaces.

At the same time for the purpose of saving fuel oil thermal electric power stations, at which the least scarce low-grade fuel is burned, are operated during the base part of the loads. At the same time the highly economical heavy-duty power blocks, which use fuel oil (including blocks with a capacity of 300,000 kW which operate on supercritical steam parameters), operate mainly with variable loads, for which they are not designed. As a result it is necessary to increase the load of the less economical thermal electric power stations, at which equipment with relatively low initial parameters has been installed. Such an organization of technically more perfect power blocks decreases their efficiency and reliability, increases the amount of repair work and shortens the maximum service life. As a result the annual expenditures on repair are now comparable to the expenditures on the construction of new electric power stations.

The Scientific Production Association for the Study and Designing of Power Equipment imeni I. I. Polzunov jointly with enterprises of the sector has elaborated a number of new technical solutions which make it possible to increase the degree of economy and the reliability of power equipment even under the present difficult

conditions of its operation. Thus, open fuel preparation circuits have been drawn up, which considerably lessen the influence on the efficiency of water heaters of both the deterioration of the quality of the fuel and the instability of its properties. As a result the operation of the furnace chamber improves, and the degree of economy of the power blocks also increases substantially: those operating on lignites--by 3-4 percent, on hard coal and anthracite fines--by 1.5-2.5 percent.

The advantages of open fuel preparation circuits have been confirmed by the 3 years of operation of block No 11 at the Burshtynskaya GRES, where such a circuit was successfully implemented. Since henceforth fuel of worse quality has to be used, while the possibilities of using fuel oil are limited, the open fuel preparation circuits are an effective means of increasing the degree of economy and the operating reliability of power blocks and require extensive introduction where this is feasible. However, the operators are still treating them with excessive caution, which, of course, is hampering the more extensive use of the new technical achievement of the power machine builders. The accumulation of the necessary data on the use of this method would make it possible to improve it.

As before, the problem of meeting the peak loads in the power systems is urgent. It is being solved in two ways: by the construction of specialized highly flexible power blocks and by the development of pumped-storage electric power stations. On the orders of the USSR Ministry of Power and Electrification the power machine builders have designed for the specialized power blocks the main equipment with a unit capacity of 500,000 kW which operates on fuel oil and gas. It was presumed that the operation of these power blocks would be halted regularly at night and on days off, which would improve the operation of the base equipment. However, the new technical developments of the power machine builders so far have not found proper practical application, although their use is economically efficient. So far there are no specific orders for the production of this equipment for specific projects. As a result the important problem of the economical meeting of variable loads with the minimum outlays of very scarce liquid fuel or gas remains unsolved.

Pumped-storage electric power stations (GAES's), as the most efficient stations for meeting peak loads, are being used extensively in industrially developed countries. GAES's, which have great flexibility, perform two functions simultaneously: they meet the peak loads and consume electric power surpluses during the period of the decline of the load. Moreover, GAES's increase the operating reliability of the main power equipment of base AES's and thermal electric power stations, which are forced in the absence of GAES's or other flexible electric power stations to operate in uneconomical variable modes.

Since the underestimation of the role of pumped-storage electric power stations in the power systems has not yet been eliminated, a slight lag has formed in their construction and, consequently, in the development of a scientific and technical reserve and in the design developments of high-power reversible hydraulic machinery. At the same time the USSR Ministry of Power and Electrification has inadequately financed the work in this promising direction and has often postponed the start of the construction of pumped-storage electric power stations. Thus, the reversible hydraulic machine for the Zagorskaya GAES, which has been designed and readied for production, is not being produced because the client, in delaying with the construction of the station, has been postponing the delivery of the equipment for it to later and later dates. Such a situation is depriving the power machine

builders of the opportunity to develop an industrial prototype of a reversible hydraulic turbine and to organize the series production of this equipment, which is needed by the national economy. Meanwhile the need to carry out the construction of pumped-storage electric power stations in the European part of the USSR is directly indicated in the Main Directions of USSR Economic and Social Development for 1981-1985 and the Period to 1990. The extensive implementation of this responsible assignment might be dragged out without justification, if the USSR Ministry of Power and Electrification does not change the attitude toward it and does not expedite the solution of the problems connected both with the organization of the construction of GAES's and with the choice of equipment for them.

The sectorial scientific research institutes jointly with the enterprises of the Ministry of Power Machine Building have proposed a fundamentally new technical direction of the further development of boiler making: the use of small boilers with the combustion of the fuel in a highly loaded vortex combustion chamber with the removal of the fluid slag. The use of such a combustion chamber ensures a high degree of burning of the fuel, increases the degree of economy of the heating process and creates the opportunity to standardize the small boiler for the use of various types of fuel. Moreover, with the combustion of solid fuel in a vortex combustion chamber it is possible to organize the high-temperature processing of the ash and to decrease the formation of cinders. This is especially important when developing boiler units, in which it is envisaged to burn Kansk-Achinsk coals which by content are up to 50 percent calcium compounds.

At the same time a small boiler has much smaller dimensions than water heaters of the traditional types. Consequently, its metal content decreases substantially, which is especially important now, when the statewide task of the universal economical consumption of material resources per unit of output being produced, especially of rolled metal, and first of all in machine building has been set. The use of small boilers also makes it possible to shorten considerably the time of their installation and creates the opportunity for the more efficient arrangement of the power block and the reduction of the estimated cost of the electric power station. Thus, the creation of small boilers for power blocks with a unit capacity of 800,000 kW, which are intended for the burning of coals of the Kansk-Achinsk deposit, is leading to a considerable saving of metal (as compared with water heaters which have a single-chamber fire box), including scarce alloy steels. Here the amount of space for the installation of a small boiler is reduced to less than one-third.

The extensive introduction at thermal electric power stations of small water boilers, which operate on solid fuel, is being checked mainly by the fact that the power machine builders lack the experimental data, which are necessary for designing and subsequent development, on the combustion of various types of fuel in a highly loaded vortex combustion chamber.

The USSR Ministry of Power and Electrification--the main client of the equipment being produced by the enterprises of the Ministry of Power Machine Building--has been postponing the date of the placement into operation of small pilot industrial plants. This does not make it possible to organize a large-scale experiment and to obtain the necessary data in due time. As a result the date of the designing of small boilers for power blocks with a unit capacity of 800,000 kW, which it is envisaged to build on the basis of the coals of the Kansk-Achinsk deposit, is being

intolerably postponed. Thus, the small boiler with an output of 500 tons of steam per hour, which was produced in 1979, has still not been installed at the Novosibirskaya TETs, while the PK-46 boiler at the Nazarovskaya GRES due to the delay of renovation by a year was fired only in February 1981.

Moreover, the technical specifications for another type of water heaters for power blocks with a unit capacity of 800,000 kW, in which it is envisaged to burn the coals of eastern deposits, were completely ready back in 1979. But the delivery of the prototypes of such boilers to the Permskaya and Berezovskaya GRES's is planned only for 1982. This will postpone the date of their subsequent design and technological modification and the organization of series production and in the end will affect the rate of the development of the coals of eastern deposits and the creation on their basis of a fuel and power complex.

In accordance with contracts with various ministries and departments the power machine builders in 1977 developed a new series of hot water boilers, which operate on solid fuel, and shipped the prototypes to the clients. But so far the majority of them have not been installed, and, of course, it is not known what parameters they will achieve in the process of operation, what it will be necessary to improve in their desire before starting mass production. The same fate has also befallen several waste heat boilers, as well as power technology units.

In spite of this, the ministries which use these products are continuing to insist on their delivery on the set dates, which subsequently will lead to considerable outlays of physical assets, which is inevitable when performing retrofitting operations no longer on the prototype, but on a large number of items. Here they will have to be improved not under plant conditions, but at the installation sites, where the overall losses will increase sharply in connection with the shutdowns of the equipment. Taking this situation into account, the Ministry of Power Machine Building perforce made the decision not to ship to clients several types of equipment until their design, on the basis of the data on the operation of the prototypes, had been brought up to the rated parameters, which ensure reliability and economy.

The same decision was also made for new gas pumping units with a unit capacity of 16,000 and 25,000 kW. In particular, the Nevskiy zavod imeni V. I. Lenina Production Association back in 1978 developed the fundamentally new GTN-25 gas pumping unit with a capacity of 25,000 kW, which should become the prototype of more powerful machines. Just as all the preceding units of this enterprise, which were intended for the gas industry, the new machine was installed at the Novgorod Pilot Compressor Station, where it had to undergo comprehensive tests. In order to begin them in good time, it was necessary to perform in a short time and with a high quality all the preliminary operations on the test bench of the compressor station, on which the gas pumping unit was installed. However, the client--the Ministry of the Gas Industry--was in no hurry to complete them. Before the delivery of the GTN-25 for series production the Ministry of the Gas Industry will be provided with the GTK-10 unit.

By the start of the 11th Five-Year Plan the situation, unfortunately, had not changed. But the task of sharply increasing the production of blue fuel and delivering it to the consumer is set in the Main Directions of USSR Economic and Social Development for 1981-1985 and the Period to 1990. A practicable means of solving it is the increase of the unit capacity of gas pumping units, the use of

total head pumps, the increase of the pressure in gas pipelines and the use of large-diameter pipe in the construction of gas transportation arteries. In this connection the Ministry of the Gas Industry requ ed the power machine builders t develop immediately the series production of a gas pumping unit with a capacity o. 25,000 kW, the tests of which it had not been possible to begin due to the unavailability of the test stand at the Novgorod Compressor Station through the fault of its workers. The tests of the GTN-25 under a load were begun only in 1980. But this means that the new machine will be placed into series production no earlier than 1983: the development of the technical specifications, the retrofit of the unit and its acceptance by the interdepartmental commission and the preparation of production lie ahead.

In the Accountability Report to the 26th CPSU Congress L. I. Brezhnev justly noted that at times we lose sight of our priority and spend considerable money on the purchase abroad of equipment which we are quite able of producing ourselves. Obviously, the departments of USSR Gosplan should approach more strictly the suggestions of the ministries on the purchase of equipment abroad and should seek the means for the development of the corresponding works by means of internal reserves on the basis of domestic scientific achievements.

The research conducted in our country and abroad attests that the further improvement of the technical and economic indicators of power equipment depends on the utilization of the potentials of combined steam-gas plants with the intracircuit conversion of solid fuel into gas. Promising studies in this direction are being conducted by the Scientific Production Association for the Study and Designing of Power Equipment imeni I. I. Polzunov. It is envisaged to burn the products of gasification in a high-pressure steam generator and to use their energy in a gas turbine. It is possible to reduce considerably the specific consumption of fuel at such plants and to decrease their metal content and their pollution of the environment. Thus, the development and introduction of the PGU-1000 steam-gas plant with a capacity of 1 million kW, which runs on Kansk-Achinsk coal, as compared with a traditional power block with a capacity of 800,000 kW provide a saving of approximately 200,000 tons of conventional fuel a year, save about 20 percent of the capital outlays, as well as decrease the metal content of the equipment. At the same time the content of harmful contaminants in the combustion products is reduced by more than half.

Thus, the advantages of steam-gas plants with the intracircuit conversion of solid fuel into gas are obvious. For the purpose of their quickest possible assimilation it is expedient first of all, as is indicated in the Main Directions, to develop a pilot industrial power block with a capacity of 250,000 kW, which would serve as the basis for the development of full-scale models of gas generators which run on solid fuel so as to subsequently put together from them blocks with a large unit capacity.

The development of steam-gas plants with the intracircuit conversion of solid fuel into gas is a technically complicated comprehensive task which requires the coordinated efforts of a number of ministries and departments. The intracircuit conversion of solid fuel into gas makes it possible to organize the efficient conversion of Eastern Siberian coals and to increase the utilization ratio of the installed capacity of thermal electric power stations and heat and electric power stations.

Centralized heat supply, which is being intensively developed in our country by the construction of TETs's, is one of the most practicable means of the economical consumption of organic fuel resources. In 1979 alone owing to central heating in the USSR 35 million tons of conventional fuel were saved, which is equivalent to the reduction of the specific consumption of fuel at the thermal electric power stations of the country by more than 10 percent.

The USSR Ministry of Power Machine Building and the USSR Ministry of Power and Electrification, based on calculated data and the evaluation of the forming situation, believe it to be expedient to maintain for the foreseeable future the achieved high rate of development of central heating, first of all in the regions of the European part of the USSR. Here it is taken into account that TETs's which use primarily organic fuel should be built up to 1990, while subsequently primarily nuclear TETs's and, obviously, nuclear heat supply stations (AST's) should be built.

While working on the solution of the technical problems on developing new, promising power equipment, the power machine builders are continuing also to improve the technological processes of its production, especially the equipment for AES's. For this purpose they are actively cooperating with the scientific centers of the country and are utilizing the achievements of world practice. However, the technological institutes and enterprises of not only the Ministry of Power Machine Building, but also other ministries which are involved in the development of electric power engineering of the country, should devote primary attention to the mentioned important matter.

Meanwhile in the chain of interaction not all the links are reliable. Thus, the Scientific Production Association for the Technology of Machine Building and the Izhorskiy zavod imeni A. A. Zhdanova Production Association developed, and the interdepartmental commission headed by Academician A. P. Aleksandrov certified and approved, a technological process of the production of the vessel equipment of AES's. In order to achieve a high quality of the blanks for it, as well as for the rotors of the turbines and gas generators a pure stock is necessary for the smelting of the steel from which they will be obtained. But the USSR Ministry of Ferrous Metallurgy so far is not supplying this stock to the Izhorskiy zavod imeni A. A. Zhdanova Production Association and the Kramatorsk Energomashspetsstal' Plant.

During the years of the 10th Five-Year Plan the Ministry of Power Machine Building fitted its enterprises with highly efficient equipment for the refining and degassing of steel outside the furnace. However, in spite of our repeated orders, the USSR Ministry of Ferrous Metallurgy still has not organized the production of domestic refractories for their lining. The Ministry of Power Machine Building has been forced to obtain them through imports, which is leading to the unjustified expenditures of state capital.

At the enterprises of our sector the technological processes of smelting steel and producing forged pieces weighing up to 220 tons have been completely developed. Now the task is being set to assimilate the obtaining of bars weighing up to 500 tons. Molds are needed for their production. The Ministry of Power Machine Building is proposing to organize the production of such molds in the steel casting shop of the Kramatorsk Energomashspetsstal' Plant. However, it has not been possible to accomplish this for the reason that so far the question of relieving the named shop from the performance of large-scale casting on the orders of other sectors has not been settled. USSR Gosplan and USSR Gossnab, obviously, should find

a means of settling this question in the shortest possible time, since considerable time has already been wasted.

The tasks of resolutely eliminating the obstacles in the way of the introduction of what is new and of interesting the works in the more rapid assimilation of the fruits of creative thought are set in the Accountability Report of the CPSU Central Committee to the 26th Party Congress. The demands made on product quality should be the highest. This especially concerns nuclear machine building.

Scientific and technical progress in power machine building is directly dependent on the level of sectorial science and the organization of a set of studies and design developments on new power equipment within the system of the Ministry of Power Machine Building. There should be set up within the sector its own design center, which would perform all the functions connected with the development and production of equipment for AES's. The many years of experience of hydraulic and steam turbine building, as well as of other sectors of machine building indicate the timeliness of such a decision. The establishment of a unified design center within the Ministry of Power Machine Building will make it possible to do without a large number of agreements of various types of documents and engineering proposals, first of all nontraditional ones, on which too much time is being spent today and which costs the state dearly. It will expedite the production of new types of improved power equipment for AES's and will make it possible to increase its efficiency and operational reliability.

The 26th CPSU Congress elaborated an extensive program of the development of electric power engineering. The power machine builders, by using the gained experience and the available scientific and technical reserve, will devote all their efforts and creative energy to the implementation of this program.

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## DEVELOPMENTAL WORK CONTINUES ON SUPER-HIGH VOLTAGE LINES

Moscow IZVESTIYA in Russian 10 Apr 81 p 2

[Article by V. Belikov: "The Electric Marathon"]

[Text] The electric transmission line right-of-way is a most characteristic feature of the modern landscape. They criss-cross our land in all directions, drawing together into tight clusters near large-scale industrial centers, gigantic plants and large cities. These electric lines are like arteries which feed the mighty organism of the economy with life-giving current. The conveyance of huge amounts of power along these lines from one end of the country to the other has received the name "electronic transport" from power specialists.

In the Central Dispatching Administration of the Unified Power System [TsDU YeES] of the Soviet Union, I had the opportunity to see on a huge chart the main trunk lines of this truly instantaneous means of transport.

The long-distance transmission lines connecting entire constellations of GES's, thermal and atomic electric power stations are marked with multicolored lines and symbols. A panoramic panel along an entire wall of the room makes a great impression. As if on a reduced scale, it represents the territory on which more than 220 million people live--from the cascade of dams on the Angara to the 750-kV Western Ukraine-Hungary transmission line.

"In the current five-year plan," says V. Mogirev, director of Central Dispatching's office of long-range development, "the two most powerful new lines, the so-called super-high voltage transmission lines, will be plotted on this chart. The laying of these lines from Priirtysh'ye, where the Ekibastuz thermal power complex with its total output of 20 million kW is being built, has already begun. The first hundred towers on the 1,500-kV direct-current line have started their trek across the Kazakhstan steppes to the west."

The height of each of these multi-ton structures is more than 40 m and the span of the crosspieces--the horizontal "shoulders" from which the long insulator strings and conductors are suspended, is also equal to 40 m. The work teams of linemen and high-wire men putting up these towers must negotiate almost 2,500 km, fording the Ishim, the Ural, the Volga and crossing railroad trunk lines, highways and dozens of other obstacles.

The passage across the great Russian river near Saratov is designed to be a twin-span transit more than one and a half kilometers long per span. Giant supports equal in height to one third the Ostankino television tower will be erected on both banks of the Volga and on a small island in the river channel. Only in this way, according to calculations of the designers, can safe passage be afforded any vessel when the water level is at its greatest.

The unusual nature of the 1,500-kV transmission line and the unique features of many of its design solutions have required that a great many studies be conducted. Leading scientific collectives and enterprises in the power-engineering, electrical-equipment, electronic and other sectors of industry have been enlisted in these studies. It suffices to say that this unique, direct-current electric transmission line has already given rise to 134 inventions of which more than a dozen have been patented abroad.

The fact of the matter, as it turns out, is that these lines accomplish different tasks. The LEP-1,500 is intended exclusively for the transport of electricity over a transcontinental distance--from northern Kazakhstan to the country's central regions.

For this it is more advantageous to utilize direct current. Direct current has lower losses and requires two conductor strands, not three, as in the case of alternating current. True, powerful transformer substations utilizing semiconductor elements will have to be built at the beginning and end of the lines but domestic science has successfully solved this most complicated technical problem. Figuratively speaking, the flow of energy of unprecedented power will run in a handmade channel from which there will not be a single branch along its entire length.

The purpose of the LEP-1,150 is different. It is to transmit the output of the first GRES's of Ekibastuz into Kustanay and farther on into the Urals and Chelyabinsk. For this type of utilization, an alternating-current line makes it possible to insure electric power supply to intermediate consumers in a simpler fashion and to commission segments of the line in stages as they are ready.

The management of these colossal power flows will be carried out by the dispatchers with the aid of high-speed computers which will indicate the most advantageous manipulation of the power outputs and will engage automatic emergency devices when necessary.

The USSR Ministry of Energy's Scientific Research Center for the Testing of High-Voltage Apparatus is located in the northern outskirts of Moscow. It is a unique test range for equipment which must begin service as early as next year on the LEP-1,150 line.

"The equipment being built for electric networks, including that which is peculiar to the LEP-1,150, does not lend itself to exact calculation," explained the supervisor of one of the laboratories in the center, S. Rovinskiy, with whom we examined one of the installations. "Only direct testing in special set-ups of switches, transformers and other equipment makes it possible to obtain answers that interest developers, testing personnel and operators."

These data are obtained during the course of prolonged testing. Repeated testing is sometimes conducted for several days at a time in two shifts.

Judging the nature of the odd curves fixed by the impassive instruments in the laboratories of the testing center, the authoritative experts drew their conclusions--the equipment developed at the All-Union Electrical Equipment Institute imeni V. I. Lenin and by other organizations for the Ekibastuz-Urals super-high voltage line satisfies the most stringent requirements for its upcoming operation. The people of the Urals themselves--from the famous "Uralelectrotyazhmash" plant--have been appointed to manufacture these units.

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## PREPARATORY WORK UNDERWAY AT TASH-KUMYR GES

Moscow IZVESTIYA in Russian 16 Apr 81 p 1

[Article by B. Prokhorov: "The Power of the Naryn"]

[Text] A practical step toward the beginning of construction of the Tash-Kumyr GES on the lower reaches of the Naryn has been the construction of a working bridge across the turbulent and capricious river.

The Tash-Kumyr GES is one more station in the Naryn hydroelectric cascade. Its first power generating unit is planned to begin operation during the current five-year plan. In order to carry out work simultaneously on two banks, it was necessary first of all to transport the construction equipment and machinery to the left bank. The "Naryngidroenergostroy" collective of construction administration No. 16 undertook to build this working bridge across the Naryn.

Power engineers from the Kurpsayskaya GES, located a few dozen kilometers downstream, promised to help the bridge builders by closing down completely all gates of the hydrosystem for a day. It was necessary during this time to lay the foundation under the bridge supports.

The construction equipment, ready for the assault, was concentrated on the bank. They waited while the river went down. As soon as the river's stony bed was exposed, the bulldozers and excavators went out on it.

The work proceeded in full swing all day, the following night, and was concluded just before morning. Foundation pits were dug,and foundations were laid under both bridge supports. They even managed to install the concrete girdle of the first support and to fill it with mix. Drivers in KrAZ trucks completed 20 long and heavy runs, bringing in concrete from the city of Kara-Kul'. In the morning, the Naryn once again filled its ancient riverbed. The builders got down to erecting the bank abutments and started to mount the bridge spans.

The new hydroelectric station will be located almost within the boundaries of the mining city of Tash-Kumyr. The riverbanks are steep here, the river channel narrow. A dam 65 m high will block the Naryn.

The mountain river will pass through tunnelled water conduits and will turn four turbines with a combined output of 500,000kW.

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## HIGH VOLTAGE TRANSMISSION LINES DISCUSSED

Tallinn MOLODEZH' ESTONII in Russian 1 May 81 p 3

[Discussion with Yuriy Lyukov, deputy director of the "Energosetproyekt" institute, by Novosti Press Agency correspondent Yevgeniy Yegorov: "Electric Transmission of Super-High Voltages"]

[Text] [Question] The USSR State Prize for 1980 has been bestowed upon a group of specialists in the electrical equipment industry and in the field of power engineering who assured the creation and introduction of 750-kV super-high voltage electric transmission lines. What are the advantages of these lines and what problems were solved during their development?

[Answer] In the European sector of the country, where the basic network for transporting electric power consists of 330-kV transmission lines, it was decided to build 750-kV lines as early as the 1960's. With respect to capacity, one such line replaces four or five 330-kV lines and reduces the labor and materials consumed in construction almost by half.

The creation of the 750-kV transmission line required that a great many scientific research and design studies be carried out and that new methods of construction be mastered. In doing so, a number of new technical solutions were developed which were previously unknown in world engineering practice for lines of this class: magnetic, valve-type lightning arresters for high-level currents, supports on guy-wires, phase designs for lines with five parallel conductors, etc.

At the present time we have over 2,500 km of 750-kV transmission lines already in service. During the next 10 years we plan to build many thousands of kilometers of 750-kV lines in our country so that by 1990 we will create a powerful branching network for the western portion of the country's Unified Power System. The electric power stations concentrated in this part of the system comprise more than half of the output of all out stations.

The creation of 750-kV lines has made it possible to adopt them as the major connections between the USSR Unified Power System and the Integrated Power System of the other member nations of CEMA. At the beginning of 1979, the world's first inter-State 750-kV line from Vinnitsa to Al'bertirsha was put under load. The commissioning of this electric bridge 1,600 km long was the concluding step in the construction of the world's largest 750-kV trunkline.

The work done on developing the LEP-750 was the foundation for mastering the 1,150-kV transmission line, the next step in nominal voltage. These lines are necessary for the further organization of the USSR Unified Power System and the output of power from large-scale electric power stations, primarily from those in the Asian sector of the country. For example, five thermal electric power stations of four million kW capacity each will be built in the Ekibastuz basin. Construction has already begun on the 1,150-kV transmission line from Ekibastuz to the Urals. Previously, a system-forming network was organized in the eastern regions using 500-kV transmission lines.

[Question] Could you tell us about the work on super-high voltage direct-current lines?

[Answer] We have accumulated a great deal of experience in the development of direct-current transmission. The 800-kV direct-current Volgograd-Donbass transmission line has been operating for more than 10 years. Construction has begun at present on the unique 1,500-kV Ekibastuz-Center transmission line. Such a line will make it possible to transport to the country's European sector a portion of the electric power which will be generated by the Ekibastuz thermal electric stations--42 billion kWh per year. The length of the trunkline will be 2,400 km. Its first phase is planned for commisioning during the 11th Five-Year Plan.

The results of testing the unique complex of equipment for the Ekibastuz-Center transmission line have made it possible to make the following conclusion: the voltage of the transformer bridge can be increased from 187.5 kV, as originally planned, to 375 kV. The strengthening of the transformer units and a number of additional solutions increasing the reliability of the electric transmission line and its compactness make it possible to reduce the number of pieces of equipment required to one third the current level. Only through this can we obtain a considerable savings in resources.

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## PRODUCTION DELAYS AT ATOMIC POWER PLANT DESCRIBED

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 19 Mar 81 p 2

[Article: "Each is Involved"]

[Text] During a shock duty crowning the preparation of the vessel for the first Don reactor ahead of schedule, the "working relay" took a step forward. Writing in the recently published issue No. 12 (116) of the newspaper SOTSIALISTICHESKAYA INDUSTRIYA, the chief of plant production dispatching at "Atommash", A. Negadaylov, said that the fact that the vessel for our "million watter" was made six months ahead of the standard schedule and with a high degree of quality owes much to the subcontractors. We are grateful to the collective of the "Izhorskiy Plant" production association for the help which they rendered and continue to render Atommash, primarily through their experience, technical documentation and equipment. Obviously, it is not a simple thing to share with us their stocks for the assemblies of reactor equipment. We understand this. We cannot, however, justify certain actions on the part of our colleagues.

Frequently, the guaranteed, mutually agreed-upon delivery times were exceeded. Other deviations from the promised time reach six months. A number of items sent by "Izhora" are lacking in quality. Defects of a very serious nature, for example, were found in the bottoms of the steam generators. We were compelled to summon experts from "Izhora" and to strive through joint effort to eliminate during the construction work the defective items that had been allowed to be sent. Even before the verdict is in on this, the situation is becoming more complicated during our production work. The semifinished items and their test samples frequently arrive without technical certification. Long months go by while we search for and collect the disassembled documentation.

There is no argument that the tension did not arise only as a result of a lack of a responsible attitude on the part of the Izhora workers toward their obligations to Atommash. It is well known that the "Energomashspetsstal'" plant in Kramatorsk must also manufacture semifinished goods for the Volgodonsk workers. Up until now, however, the plant has not been working up to volume as planned and thus has frustrated the task planned for it. The quicker this lost time at Kramatorsk is made up, the more efficiently things will run at Atommash.

The list of omissions behind which are external circumstances, alas, cannot be reduced to this sort of solution. We as yet do not have the production modification

of the design documentation for the steam generators and pressure compensators in the seismic version.

The present situation with regard to the load placed on commissioned capacities is ambiguous. If you look at it on the whole, our order portfolio reckoned on the basis of production volume is fulfilled. The product list of items ordered by way of the intraindustry cooperative system, however, has not been determined up to the end.

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## BRIEFS

CRYOGENIC POWER TRANSMISSION--Leningrad, 4 May (TASS)--Leningrad specialists have proposed the simultaneous pumping of hydrogen and the transmission of electric power, both produced from coal from the Kansko-Achinsk deposits. Scientists from the Technological Institute of the Refrigeration Industry have undertaken the development of a design for an original regrigerated pipeline. "Soviet experts have found several efficient methods of processing coal deposits, which are unique with respect to the size of their reserves," said Professor G. Golovko, director of the institute's department of cryogenic technology. "On the basis of these methods, we plan to produce chemical products, in particular, hydrogen and liquid synthetic fuels, together with electric power. Consumers of these products are frequently hundreds and thousands of kilometers removed from the Kansko-Achinsk fuel and power production complex. We have proposed compressing the gas at super-low temperatures and then sending it to the enterprises along the pipelines. The pumping of compressed gas in refrigerated pipes makes it possible to simultaneously transmit a great amount of electric power with practically no losses. In order to do this, such a pipeline would have to be covered with the thinnest sheathing of superconductor. Experiments conducted under laboratory conditions have confirmed their calculations." [Text] [Moscow PRAVDA in Russian 5 May 81 p 3] 9512

WINDMILLS CLOSED--Cherboksary--All wind and water mills in Chuvashiya have been eliminated. This was hardly justified. It has come down to the kolkhoz workers' being unable to mill the grain. Indeed, everyone knows that the utilization of renewable resources--in this case, wind and river currents--present great advantages. It is by no mere coincidence that data are frequently being published in defense of mills. There is no denying, however, that they have evidently hurried to shut down the mills in our autonomous republic. [Text] [Moscow PRAVDA in Russian 5 May 81 p 3] 9512

ATOMIC TETS ON DNESTR--Odessa, (TASS)--The Odessa atomic TETs will meet the demands of a city of one million for heat and electric power. The first cubic meters of concrete have been laid in the foundation of this pioneer domestic atomic thermal and electric power plant. This largest new construction project of the five-year plan, whose construction was envisaged in the Basic Directions for the Economic and Social Development of the Country, is being erected on the bank of the Dnestr. Two power generating units with an output of one million kW each will be built here and a settlement of builders and operators will grow up as well. The commissioning of the atomic TETs will make it possible to reduce the load on the power system supplying the Krivoy Rog and Zaporozh'ye GRES's, thereby conserving

more than two million tons of coal, gas and fuel oil annually. The commissioning of this TETs, absolutely reliable in an ecological respect, will allow us to close down more than 400 small-scale boiler plants. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 17 May 81 p 2] 9512

CHERBOKSARY SEA--CHERBOKSARY, 27 Apr--These days, city residents come to the banks of the Volga to see how the second stage in the filling of the Cherboksary Sea is being realized. This sea is being created in connection with the construction of a new GES--the concluding stage in the Volga power cascade. The level of the water here rose seven meters in December of last year. Now the water level must be raised another two meters. This will improve good conditions for the passage of all types of vessels. [Text] [Moscow PRAVDa in Russian 28 Apr 81 p 1] 9512

ODESSA ATOMIC TETS--Odessa--A sign appeared not far from one of the villages on the Dnestr: "Construction Site of the Odessa Atomic TETs." Here work had begun on the construction of the country's first atomic thermal center. As early as the end of the current five-year plan, as established by the Basic Directions for the Economic and Social Development of the Country, its first phase should go into operation. Much preparatory work on the formulation of the station's detail design was carried out in a short period of time by Kiev, L'vov, Gor'kiy and Odessa design organizations. Sections of the "Odesstransstroy" trust, "Chernomorgidrostroy" and the "Odessgromstroy" combine will erect the Odessa atomic TETs along with the power station construction workers. The Dnestr will also "work" on the atomic station. Construction will begin in the near future on moorage sites for the river port. [Text] [Kiev PRAVDA UKRAINY in Russian 17 May 81 p 1] 9512

MOUNTAIN RANGE TRANSMISSION LINE--A 500-kV electric transmission line has been laid across the most difficult section of the Main Caucasus Range. This electric transmission line will deliver power from the Inguri GES to cities and villages in the northern Caucasus. Many difficulties had to be overcome by the collective of the "Kavkazelektroset'stroy" trust in assaulting the Nakharskiy pass. The linemen were greatly assisted by peoples' deputies from regions through which the right-of-way passes. They suggested that helicopters be used to transport equipment to the construction sites. For the first time in the domestic construction of high-voltage transmission lines, structural elements of the reinforced concrete foundations, metal trusses and much else was delivered by air. This electric transmission line will be the most powerful line connecting the Transcaucasus with the Stavropolskiy Kray. The 600-km right-of-way is slated for operation during the current five-year plan. [Text] [Baku VYSHKA in Russian 17 Apr 81 p 3] 9512

HEAVY-DUTY TRANSFORMER--Yuzhno-Sakhalinsk, 27 Apr--The "Sakhalin-6" diesel-electric ship, usually serving the Vanino-Kholmsk ferry crossing, this time took a course to the north, to Magadan. Just as a year ago, the crew of the vessel is delivering a 186-ton transformer for the Kolyma GES. Later the transformer will have to negotiate a 500-km journey on a trailer specially made for this purpose. [Text] [Moscow PRAVDA in Russian 28 Apr 81 p 6] 9512

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# NEED SEEN FOR IMPROVED DEVELOPMENT WORK IN UKRAINE'S COAL MINES

Kiev UGOL' UKRAINY in Russian No 5, May 81 pp 2-4

[Article by V. A. Voronin, first deputy UkSSR minister of Coal Industry: "The Status of and Prospects for Mine Development Operations at the Ukraine's Underground Coal Mines"]

[Text] The Accountability Report that CPSU Central Committee General Secretary Comrade L. I. Brezhnev delivered at the 26th CPSU Congress pointed out that successes of the country's economy during the 11th Five-Year Plan will depend greatly upon an increase in extractive industry effectiveness. Stable and highly productive operation of underground coal mines can be provided only where there is timely and good quality preparation of the line of breakage faces. This requires that more attention be paid to integrated mechanization of development operations, to increasing the tunneling pace, and to improving mine-work technology and organization of the work of tunneling brigades.

The driving of development workings is one of the basic technological processes of underground mines, the significance of which increases with progress in comprehensive mechanization, the concentration of breakage faces, and improvement in the mining activity. The successful conduct of mine-development work provides for the rhythmic operation of mine work.

Remarkable changes in promoting developmental operations occurred at the Ukraine's underground coal mines during the 10th Five-Year Plan. Improvement of the mining activity and conversion to pillarfree excavation of coal and to progressive systems for mine development helped to change the specific ratio of various types of driving work in the overall amount of driving performed. While in 1975 the share of stripping and preparatory working in the total amount was 61.2 percent, in 1980 it had risen to 65.7 percent. At the same time, the share of preparatory driving was, respectively, 28.6 and 26.3 percent.

A tendency toward an increase in offset lateral inclined driving has been identified. Because of the movement of mining work to deeper horizons, it has become necessary to use supports with greater yield and to increase the cross-sectional area of developmental workings. During the 10th Five-Year Plan the cross-sectional area of such workings grew by 8.8 percent (from 6.8 to 7.4 $m^2$), and for stripping and preparatory workings by 8.3 percent (from 8.4 to 9.1 $m^2$). Calculations have established that these changes have adversely affected average indicators (labor intensiveness and driving speed) of development operations for UkSSR Minugleprom [Ministry of Coal Industry].

The pool of tunneling equipment changed qualitatively and quantitatively at UkSSR Minugleprom coal mines during the 10th Five-Year Plan. Thus the fleet of continuous miners increased 1.7-fold, loaders with side feed (1PNB-2 and 2PNB-2) 1.1-fold. The introduction of 4PP-2 tunneling cutter-loaders, KN longwall mining machines and 2PNB-2B loaders with toolbar drilling equipment commenced. Expansion of the area of use of said machines enabled continuous miners to increase the driving of workings from 405.8 to 638 km, side-feed loaders to increase it from 340.5 to 499.3 km, and BU and BUE drilling installations to increase it from 206.1 to 305.8 km.

The level of mechanization of the driving of mine workings rose from 75.1 to 77.1 percent, while the level for stripping and preparatory driving exceeded 90 percent. The highest level of continuous-miner tunneling was reached in the coal production associations Pavlogradugol' (92.5 percent), Aleksandriyaugol' (80.7 percent), Dobropol'yeugol' (69.7 percent) and Ukrzapadugol' (46.2 percent).

Quantitative and qualitative growth in reequipping developmental faces with machinery and high levels in organizing tunneling work and in disseminating the experience of advanced tunneling brigades were instrumental in 10 associations' having fulfilled the program for progress in mining work with respect to the amount of development working done under the 10th Five-Year Plan, and in 9 associations' having done so under the 1980 plan. The highest growth in above-plan amounts of development working was reached in the coal-production associations of Dobropol'yeugol' (39.7 km), Torezantratsit (32.2 km), Donetskugol' (14.5 km) and Shakhtersk-antratsit (8.2 km).

Increase in the amounts of driving of development workings results in an expansion of the front of breakage faces at many underground mines and associations. The number of operating breakage faces increased by 143 for UkSSR Minugleprom. The greatest growth was noted in the coal-production associations of Donetskugol' (32 breakage faces), Artemugol' (31), Pavlogradugol' (21), Makeyevugol' (16) and Torezantratsit (14 breakage faces).

Advanced high-speed brigades that do 3-5 km of development driving each year at an average monthly pace of 300-400 meters (see table), which is 2-fold to 3-fold the average speed for UkSSR Minugleprom, are making a great contribution to successful progress in mining work.

At work at the republic's underground mines are 248 high-speed tunneling brigades (10.7 percent of the total), which did 532 km of stripping and preparatory driving in 1980. High-speed brigades at the coal-production associations Pavlogradugol' and Dobropol'yeugol' did, respectively, 53.4 and 45.7 percent of the development driving, at average rates of 174.9 and 155.7 meters per month.

Thanks to the selfless labor of the high-speed brigades, most of the republic's mines have the required breakage-face frontage. Wide propagation of the experience of the advanced collectives is a guarantee of successful fulfillment of the program for progress in mining operations.

The reequipping of developmental faces with machinery and the introduction of flow charts and of advanced experience have enabled the adverse effect of changes in the structure and area of the workings to be partially reduced. However, during the 10th Five-Year Plan, the average monthly speed of stripping and preparatory driving was 84 meters versus 90.8 meters in 1975.

| Association and underground mine (or sh/u [mine administration]) | Brigade leader | Basic tunneling equipment | Driving work done per yr, m | Monthly speed of driving, meters | |
|---|---|---|---|---|---|
| | | | | Avg | Max |
| Donetskugol', imeni Abakumov..... | V. G. Vendilovich | GPK cutter-loader | 4,139 | 345 | 1,507 |
| Makeyevugol', imeni 25 s"yezda CPSU..... | V. P. Sidorenko | GPK cutter-loader | 3,570 | 298 | 1,100 |
| Krasnoarmeyskugol', imeni Korotchenko..... | L. P. Makhnev | GPK cutter-loader | 4,643 | 387 | 457 |
| Krasnoarmeyskugol', Krasnolimanskaya..... | N. Ye. Stepin | GPK cutter-loader | 4,977 | 415 | 565 |
| Shakhterskantratsit, Stozhkovskaya | S. G. Lemishevskiy | 4PU cutter-loader | 3,332 | 278 | 330 |
| Torezantratsit, Chervona zirka.... | D. G. Khomich | 1PNB-2 machine | 3,864 | 322 | 475 |
| Voroshilovgradugol', Voroshilovgradskaya No 1..... | V. A. Plyuvako | 4PP-2 cutter-loader | 3,227 | 269 | 1,003 |
| Pervomayskugol', Toshkovskaya..... | P. P. Grin'ko | 1PPN-5 machine | 2,832 | 236 | 360 |
| Donbassantratsit, Znamya kommunizma..... | I. M. Naumov | PPM-4 machine | 3,464 | 289 | 380 |
| Roven'kiantratsit, sh/u Roven'-skoye..... | A. A. Overchenko | PPM-4 machine | 3,502 | 292 | 501 |
| Pavlogradugol', Pavlogradskaya.... | Ye. M. Koshelev | PK-3r cutter-loader | 5,865 | 489 | 1,050 |

The basic cause of this was the inadequate level of engineering and organizing work at some underground mines and associations. The potential of the high' productive tunneling machinery still is not being used completely. There are 1.7 continuous miners for each UkSSR Minugleprom working that is being driven by continuous miners, and 1.8 loaders for each one being driven by the blasthole drilling method. Tunneling cutter-loaders are being used unsatisfactorily in the coal-production associations Ordzhonikidzeugol', Torezantratsit, Voroshilovgradugol', Pervomaysk-ugol' and Krasnodonugol', where 10 out of 26 combines of the 4PP-2 type were in operation. At some underground mines, worktime losses at developmental faces were 20 percent, having increased over such losses in 1979. Tunnelers are being used on work not associated with the driving of workings. The rich experience of advanced tunneling brigades is not being used fully. In 9 associations less than 25 percent of the developmental driving is being done by the high-speed method.

There are deficiencies in developing the technology for and in mechanizing mine-development work. The integrated mechanization of processes, especially in the erection of supports, is lacking, causing the machine operating-time coefficient for tunneling and preparatory driving by continuous miners to be very low. This does not enable a substantial growth in tunneling speed. Existing tunneling cutter-loaders can destroy rock with a strength coefficient no greater than 5. A large amount (450 km) of the workings have not been provided with mechanizing equipment for loading coal and rock. This relates primarily to preparatory driving work that is being conducted at seams less than 0.7 meter thick and more than 1.2 meters thick, and at inclined workings that are being worked from the bottom up and have a slope of more than 10 degrees throughout the whole thickness band of the seam, or to workings that are being worked from the top down and that have a slope of more than 18 degrees, and also to excavations (airways) with the gobbing of rock into the worked space of the longwall, and others.

The processes of erecting supports and the methods for protecting developmental workings are multiple-operation in nature and are not amenable to mechanization, which makes it difficult to create means for the integrated mechanization of driving, timbering and protection of the workings. Up to the present the question of mechanizing the gobbing of hollows in workings still has not been solved.

The main areas for improving the technology of driving workings at fine seams are in searching for those solutions that will enable a reduction in the amount of rock work (for workings that are driven with a composite mine face) and reduction in the length of preparatory workings without the constant presence of people at the mine faces thereof where there are automatic and remote control of mechanisms (especially at seams with a vibration hazard). Moreover, at workings of great length these safety factors acquire special significance. The problems posed can be solved with the use of KN-type longwall preparation machines and KSV longwall mining machines for driving paired workings that include gobbing of the rock.

Highly productive serially produced tunneling machinery still is not being used adequately. Thus, PK-3r and GPK continuous miners are being produced in numbers that exceed the possible volume of use, while continuous miners (for example, the 4PP-2 and the KN longwall mining machine), which make it possible to increase tunneling, are being shipped in inadequate amounts. The potential amount of driving of workings by 4PP-2 continuous miners is 270 km, while for KN longwall mining machines it is 50 km, but the amounts actually achieved in 1980 were, respectively, 72 and 25.4 km. Only 5 percent of the workings out of the total potential are being driven by

the 1PNB-2B and 2PNB-2B loaders, which have toolbar drilling equipment.

The following machines are arriving at UkSSR Minugleprom underground mines for purposes of equipping developmental faces during the 11th Five-Year Plan: the KRT continuous miner for driving workings 16.5 $m^2$ in cross-section in rock with a strength coefficient of 6-8; the 4PP-2 continuous miner for tunneling workings 10-30 $m^2$ in cross-section with a composite mine face in rock with a strength coefficient of less than 6; the KSV set of equipment for driving paired workings with a wide mine face; the Soyuz-19 unified tunneling complex for tunneling workings in rock with a strength coefficient of less than 10; 1PNB-2u and 2PNB-2u loaders for driving workings on a slope of less than 18 degrees; and other equipment.

In order to create the necessary front for breakage and to provide for stable operation of UkSSR Minugleprom underground mines during the 11th Five-Year Plan, stripping and preparatory driving must be brought up to 2,150 km in 1985, that is, tunneling volume must increase by 45 km annually. This task should be performed mainly by increasing the number of high-speed brigades to 350 in 1985, based upon wide generalization and dissemination of advanced experience in accordance with a harmonious and precisely operating system that embraces all management levels (the ministry, the production association, the mine, and the brigade); by raising the engineering level of support for developmental work; by bringing the level of cutter-loader tunneling up to 32-34 percent by increasing the machines' utilization coefficient and productivity and by expanding the application of 4PP-2 continuous miners and KN longwall preparation machines; and by greatly reducing the driving of workings where there is manual loading of coal and rock as a result of using 1PNB-2u and 2PNB-2u machines for inclined workings and of preparatory cutter-loaders and scraper installations under conditions for which there is no mechanized equipment.

The republic's underground miners, having entered the first year of the 11th Five-Year Plan, promoted socialist competition also for the first 2 months of 1981 and did 8.5 km of stripping and preparatory driving above the plan, thereby making their meaningful contribution to realization of the decisions of the 26th CPSU Congress and the 26th Congress of the Ukrainian Communist Party.

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# CAUSES OF, CURES FOR UNFINISHED CONSTRUCTION IN AZERBAIJAN DISCUSSED

Baku AZERBAYDZHANSKOYE NEFTYANOYE KHOZYAYSTVO in Russian No 4, Apr 81 pp 72-74

[Article by Ye. Ye. Rasul-Zade and A. B. Gasymly of NIIekonomiki [Scientific-Research Institute for Economics] under Azerbaijan SSR Gosplan: "The Causes of and Ways to Reduce Uncompleted Construction in the Azerbaijan SSR Oil-Recovery Industry"]

[Text] The main task in planning capital investment is the rational distribution thereof with a view to meeting more rapidly the requirements for fixed capital in amounts that correspond to the contemplated pace and proportions of expanded reproduction. In the modern era, development of the socialist economy depends greatly upon the correct distribution and effective use of capital investment in the republic's economy.

During 1970-1979 the republic's economy was sent 13.6 billion rubles in funds (not counting kolkhozes), which about equals the amount of capital investment for the preceding 50-year period (1920-1969). In 3 years of the Tenth Five-Year Plan alone the pace of introduction of fixed capital into operation surpassed the rate of growth in capital investment; this resulted from a speedup in the introduction of facilities under construction, and it led to a relative reduction in uncompleted construc ion in the republic.

The main share of capital investment within the republic is aimed at developing the traditional branch--the oil-recovery industry. During 1976-1979, 1.6 billion rubles were invested in this industry.

The main share of the oil and gas obtained by the republic's oil-and-gas recovery industry (more than 64 percent) is at offshore fields, which are marked by high capital intensiveness. VPO Kaspmorneftegazprom [All-Union Caspian Offshore Oil and Gas Industry Production Association] assimilates about 71.5 percent of all the industry's capital investment. Correspondingly, its share in the industry's uncompleted construction is great (73.0 percent). During 1976-1979 this was 317.2 million rubles. On 1 January 1979 uncompleted construction (according to actual cost) in the oil-and-gas recovery industry amounted to 436.6 million rubles, or more than 28 percent of the republic's uncompleted construction. Analysis indicated that, taking the industry's capital investment structure into account, the norm for uncompleted construction should be about on the 70 percent level. In this case the above-norm amount of uncompleted construction in the industry is about 135 million rubles.

One of the main causes for growth in uncompleted construction is the low level of capital-investment planning within the industry. This is explained partly by the fact that up to the present the construction and installing work of the contracting organizations that is being carried out is not correlated with the turnover of finished facilities. The contractors have been motivated primarily toward fulfilling the plan for total amount of work on the less labor-intensive but more materials-intensive jobs. From this also comes a dispersion of capital investment, which in turn leads to a dispersion of the forces and funds of the contracting organizations, to the nonfulfillment by them of goals for introducing production capacity and facilities into operation, to crash work, and to low work quality. This can be confirmed by the fact that, despite a large amount of uncompleted construction, the 1979 plans for Azneft' [Azerbaijan Oil Production Association] and Kaspmorneftegazprom included another 106 new facilities. Deficiencies in capital investment planning that are associated with the distribution of expenditures over numerous previously started construction projects, and also with the allocation of an inadequate amount of funds for carryover or newly started construction projects, do not at present permit all actual construction deadlines to be brought close to the standards.

Because of the delay in introducing some facilities, it often becomes necessary to reexamine the technical papers. Often there are cases where equipment arrives late at the facilities being built, or there is the reverse picture--where uninstalled equipment that is subject to deterioration and obsolescence waits a long time in warehouses of enterprises that are being built. Housing and public-building construction that is performed on the basis of standard designs rely upon a high-capacity industrialized base. However, even here the introduction of facilities into operation much later than the standards allow is observed. An analysis of the main cause for failing to meet the deadline for introducing jobs into operation was incomplete assimilation annually of capital investment by contracting organizations, as well as some unsolved problems of an organizational nature. These can include the following: inadequate development of the system for substantiating plan tasks for introducing fixed capital into operation, inadequate consideration of the technical and economic peculiarities of the construction, the weak tie between the indicators for introducing fixed capital in kind into operation and the cost indicators of the production activity of construction and installing organizations, and the lack of economic motivation for the clients and the contractors to reduce construction time.

The main share of uncompleted construction for the republic's oil-and-gas recovery industry is in drilling. For example, its share in the total amount of uncompleted construction for VPO Kaspmorneftegazprom on 1 January 1979 was 63.7 percent, and for Azneft' it was 88.5 percent. The share of construction and installing work in the technological structure of uncompleted construction in VPO Kaspmorneftegazprom is 9.5 percent, and the share for equipment is 24.5 percent, while in Azneft the figures are, respectively, 9.6 percent and 1.9 percent.

In his concluding speech at the 20 November 1979 Plenum of the Azerbaijan TsK KP [Communist Party Central Committee], Politburo candidate member and first secretary of the Azerbaijan TsK KP Comrade G. Aliyev stated: "...the plan for exploratory and operational drilling is not being carried out..., there are many accidents and faults in the work of the associations, and there is violation of technical discipline."* In the first 9 months of 1979 uncompleted construction in

*BAKINSKIY RABOCHIY, 22 Nov 79.

Kaspmorneftegazprom grew by 6.1 percent over 1976 for drilling, by 30.9 percent for operational drilling. The large number of accidents affects growth in uncompleted construction work basically. An analysis that was conducted enabled it to be established that the main share of accidents in the oil-and-gas recovery industry was associated with violation of industrial-operations discipline (46 percent), with intricacies in the technical procedures for dealing with geological factors (37 percent), with low quality of equipment (6 percent), and with other factors. For the oil-and-gas recovery industry the share of idle time for organizational causes is great. For VPO Kaspmorneftegazprom, for example, it is 10.8-17.2 percent of all worktime. Despite an annual reduction thereof, idle time of an organizational nature still remains high. In 1978 the share of this indicator was 17.2 percent of all calendar time. This was occasioned mainly by deficiencies in the supplying of materials and equipment. More important in this case is the delayed supplying of casing, which caused 46 percent of all idle time of an organizational nature (33.7 percent in Azneft').

All that was mentioned above gives us a foundation for advancing a number of recommendations for an accelerated reduction in the amounts of above-standard uncompleted construction work for the industry:

Uncompleted construction must be inventoried with a view to concentrating capital investment on the uncompleted construction at facilities that have a high degree of technical readiness;

Pay special attention to the balancing of capital investment plans with supply and equipment resources;

Observe strict rhythmicity in the operation of fixed capital;

Improve the supplying of materials and equipment in order to reduce idle time of an organizational nature;

During the drilling of production wells and, especially, exploratory wells, strictly observe the drilling technology and the deadline for removing them from emergency status by more intensive use of the scientific and technical arsenal for drilling operations;

Improve organizational and management work in construction work;

Write off liquidated wells on time; and

With a view to accelerating the introduction of facilities, construction organizations of the associations must transfer to the system of planning and evaluation of their activity in accordance with the "commodity" (finished) construction output indicator.

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USSR

HIGHER LABOR OUTPUT BETTER THAN MORE MANPOWER IN TYUMEN' OILFIELDS

Moscow TRUD in Russian 17 May 81 p 2

[Article by N. Bulgakov, chief of Glavtyumenneftegaz [Main Administration for Oil and Gas Recovery in Tyumenskaya Oblast] and Hero of Socialist Labor (Tyumen'): "For the Oil Wealth of Tyumen'"]

[Text] How to increase recovery of the "black gold."

The report of CPSU Central Committee General Secretary Comrade L. I. Brezhnev at the 26th party congress defined precisely and clearly the tasks of Siberia's oil and gas-field workers for the forthcoming five-year plan: "The recovery of gas and oil in West Siberia and the transport thereof to the country's European portion are to be made most important elements of the energy program of the 11th and also of the 12th five-year plans.

The specific figures of the "petroleum" chapter of the program speak eloquently enough about its scale and complexity. During the 11th Five-Year Plan we are to recover 1.7 billion tons of crude (including gas condensate)--almost as much as has been obtained since the start of the conquest of the Tyumen' oilfields. The level of recovery at the end of the current five-year plan should be 385-395 million tons for West Siberia.

It should be said that this is an unusually complicated task. In order to accomplish it we must drill through about 80 million meters of rock in Tyumenskaya oblast alone, turn over for operation 25,000 new wells, put 27 new fields under development, and assimilate 26 billion rubles of capital investment. The total amounts of drilling, construction and installing work will thus be more than triple the last five-year plan's. It stands to reason that this will require an increase in worker manning at the oblast's oilfields. And here the question arises: just how much should manning be increased--should it also triple?

Let's dwell on this problem in more detail.

The most labor-intensive, expensive and important operation in our industry is drilling. Without wells there is no oil, and this says it all. So an increase in recovery requires, naturally, a sharp boost in development drilling. Already this year it should exceed last year's level by 40 percent, and by the end of the five-year plan it should reach unprecedented amounts--20 million meters. How is this task to be coped with?

We shall speak frankly: in recent years no technical achievements in domestic drilling operations have occurred that were so basic that they would enable labor productivity to be raised by 40 percent with one stroke this year. Consequently, in carrying out the contemplated drilling program, Glavtyumenneftegaz will have to accumulate new capacity in one way or another. Based upon the current technical level of this production and the dynamics of its development, we will have to have 430 operating brigades by 1985 instead of the 193 at the start of the current year to fulfill the planned amount of work. Total worker manning for drilling operations will reach 100,000, with an average penetration of 52,000-54,000 meters per brigade per year.

Such is the calculation. But is it realistic to increase the number of brigades so much? For this will cause a chain reaction in the forming of complicated problems. Primarily additional difficulties associated with housing, personal-amenity arrangements, the hauling of rotation-type duty personnel and expeditions, and so on will appear. In the final analysis all this will require no fewer expenditures of manpower and funds than the basic operations.

In other words, it is completely clear: we cannot rely mainly on increasing the number of brigades and drilling administrations later on. Even now we are compelled to import more than 10,000 people monthly by air from other parts of the country. There is one cause: we have nowhere to settle these people, there is not enough housing, not only immediately at the fields but even in the base cities. For indeed each new drilling brigade will require the creation of additional allied and subsidiary services. Today there are, aside from the drillers, 200 workers for each brigade. This means that new bases and services, housing and all the rest will be needed. Thus the way out of the situation is not just an increase in worker manning. This will only create additional complications.

Of course we shall create new brigades, you cannot get away from that. But nevertheless it is basically necessary to choose another direction--a sharp rise in drilling operations effectiveness. Our best brigades--those of G. Levin, A. Shakshin, V. Gromov and A. Spitsin--last year drilled 20,000-30,000 more meters of hole than other brigades that worked in these oilfields. This is where our main reserve is, this is where efforts and energy must be directed.

Improvement of work organization is the most obvious unused reserve that is visible to the naked eye. Idle time during the working process and worktime losses during the preparation of new well clusters are still great. We can and should greatly reduce the "windows" in drilling and increase the work done per brigade, primarily through better technical equipping of the drillers and uninterrupted supplying of material and equipment resources. Right now, however, in many drilling administrations up to 50 percent of the rigs require replacement, and chronic shortages of spare parts and tools are being experienced. This is why we are appealing to the ministries of heavy and transport machine building and of defense industry with a most persistent request--provide for the shipping of outfitted drill rigs to Tyumen' oilfield workers.

Already this year we must reach the goal of 50,000 meters of penetration per brigade per year. It will be necessary in the future to provide for constant growth of this indicator. This, we repeat, is our chief reserve. It is incomparably more profitable and easier to supply everything that an existing brigade requires for yielding maximum output than to create a new one.

In this connection I would like especially to call the attention of Minkhimmash [Ministry of Chemical and Petroleum Machine Building] and certain other machine-building ministries to this circumstance. In developing and producing equipment for the oilfields, they still do not consider the peculiarities of our region. We lack specialized mechanisms for a highly mobile transport base, which can operate at reduced temperatures and where there are no roads, with repair work to be accomplished at the wells and at other facilities and structures.

We should obtain the main increment of increased oil recovery during this five-year plan through an acceleration in the conquest of new areas. And it is very important here to build up the oilfield facilities. This is a new existence, based on remote, out-of-the-way lands. Here are new bases and settlements, roads and LEP's [power transmission lines] and new collectives. There is a complex of large and small problems that must be solved before the first ton of crude arrives at the trunk farm.

The main burden of work to build up oilfield facilities rests on the shoulders of our contractors--construction enterprises of USSR Minneftegazstroy [Ministry of Construction of Petroleum and Gas Industry Enterprises], Mintransstroy [Ministry of Transport Construction], Minenergo [Ministry of Power and Electrification], Minpromstroy [Ministry of Industrial Construction] and others. Additionally, they are to construct 4 million square meters of housing during the five-year plan, kindergartens for 16,000 children, schools for 30,000 pupils, stores with 45,000 square meters of space, dining halls that seat 29,000, as well as dozens of other social and personal-amenity facilities. A substantial increase in production capacity also is included in the construction program. Realization of these plans will depend directly upon an increase in the capacity of local main construction administrations and construction trusts. The ministries named are called upon to extend concrete, businesslike help to their subunits in Tyumenskaya Oblast in order to provide for systematic and stable development of the oil and gas industry complex.

Finally, the lack of precision, rhythm and plan discipline in providing oil production facilities with supply and equipment resources cannot help but worry us. Especially often the realization of funds for ferrous metals, lightweight alloy casting, nonmetallics, coveralls and decorative materials is disrupted. Difficulties arise regularly with fuels and lubricants. It would be well that USSR Gosnab, beginning this year, put our region under the most rigid monitoring and insure rhythmicity of supply and precision in shipments.

Coordination in the work of interdependent enterprises, optimal engineering solutions and high responsibility for developing the oil and gas complex in Siberia will help in carrying out more quickly and effectively the tasks defined by 26th party congress decisions.

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FUELS

NEW OIL HYDROREFINING FACILITY AT NOVOBAKU REACHES DESIGN CAPACITY

Baku VYSHKA in Russian 31 May 81 p 1

[Article by O. Nechipurenko (Baku): "The First Product"]

[Text] The installations for oil hydrorefining that were built at the Oil Refinery imeni 22 s"yezda KPSS are not very large.

"It is this compactness that is one of its chief virtues," remarks chief of the plant's production section R. Akhmedov. "New technology replaces the obsolete processes of acid refining and contact filtration of oil, which lead to great losses of petroleum product and pollute the atmosphere and the soil."

On the eve of Chemical Workers' Day here, product was obtained successfully more than a month ahead of schedule: the first hundreds of tons of automotive tractor oil, which was produced with the best quality specifications.

A complicated process goes on here. Hydrogen from the catalytic reforming complex at the NBNZ [Novobaku Oil Refinery] imeni Vladimir Il'ich, which was brought to design capacity by Chemical Workers' Day, is mixed with intermediate oil product and, stepping over a long route of furnaces, columns and reactors of the installation, cleans it of unnecessary impurities.

The rotating-duty detachments of V. Rustamov, N. Abdullayev, N. Dadashev and V. Ibragimov master this process quite well today. Many of them went through on-the-job training at oil hydrorefining installations in Volgograd and Ufa, and all have studied at special courses in which leading specialists of the plant conducted exercises. Therefore, when the installation was built at the end of last year, it was decided to master the new process at the plant not with the forces of setting-up and adjustment brigades, which were busy at this time at NBNZ imeni Vladimir Il'ich, but independently. The mission was to bring the installation up to design capacity as rapidly as possible.

The collective of the installation and of the plant's auxiliary services introduced more than half a hundred changes into the original process in order to provide for uninterrupted operation.

It must be said that the automatic arrangements by which the operators monitor pressure, temperature, space velocity and other process parameters operate reliably. Experienced instrument operators Valeriy Barabash and Sergey Lapin, after

long effort, achieved precision operation of the equipment for signaling and blocking of the high-pressure "hydrogen" compressors--one of the most important units of the installation. And ahead is a new and important task. Soon, for the first time at the plant, the "Neft'" system, which issues optimum decisions for conducting the process by means of pneumatic integrating devices, will begin to operate here.

"The quality of the first output is high," says chief process engineer of the plant T. Gustov. "We determined this right away by its main indicator--color."

Introduction of the oil hydrorefining installation into operation is still another important step on the road to completing the rebuilding of the Baku Oil Refinery.

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SCHEDULE FOR NEXT CONSTRUCTION WORK AT MAZHEYKYAY OIL REFINERY DETAILED

Vilnius SOVETSKAYA LITVA in Russian 6 Jun 81 p 2

[Article by V. Ryabov, chief of Soyuznefteorgsintez [All-Union Industrial Association for Oil Refining and the Production of Organic-Synthesis Products]: The Goals Have Been Defined"]

[Text] In analyzing in SOVETSKAYA LITVA problems associated with erection of the second line of the Mazheykyay Oil Refinery, First Deputy Lithuanian SSR Minister of Construction A. Shestakauskas, chief of the Baltic SMU [Construction and Installing Administration] of Union Trust No 7 N. Kurepin, and chief design engineer Yu. Rivkin of Orgtekhstroy [State Trust for the Industrialization of Construction] raised a number of questions of an organizational and technical nature, whose solutions, in their view, should help the matter to succeed. We publish below an answer to the newspaper article by the chief of the All-Union Industrial Association for Oil Refining and the Production of Organic-Synthesis Products of USSR Minneftekhimprom [Ministry of Petroleum Refining and Petrochemical Industry] V. Ryabov.

The first line of the Mazheykyay Oil Refinery was built and put into operation during the 10th Five-Year Plan in accordance with the task of creating petroleum-refining capacity in the Baltic area.

A huge production base for construction and installing organizations was created and is in operation at Mazheykyay. A vocational and technical vocational school for 600 was put into operation. Since 1977 it has been providing training for construction personnel and operators.

"The Main Directions for the Economic and Social Development of the USSR During 1981-1985 and During the Period up to 1990" calls for further development of the Mazheykyay Oil Refinery. A complex for producing asphalt and the second main industrial installation are to be put into operation, and a construction-work start is to be made on the complex for high-severity oil refining. It is planned to assimilate 3.3 million rubles of capital for the first of these facilities in 1981, 8 million rubles for the second.

Capital investment in the amount of 0.5 million rubles was allocated in 1981 for developing a production base for the construction and installing organizations that

are erecting the refinery. In 1984-1985 the vocational and technical school is to be expanded to take 200 more students.

USSR Minneftekhimprom examined and approved the startup complexes for capacity that is to be introduced. Technical documentation for the full amount for the construction of the asphalt installation and documentation in the amount of 17.5 million rubles (taking into account the technological sequence for doing the construction and installing work) for erection of the second basic industrial installation have been developed.

The equipment for producing asphalt will be shipped in 1981. It is planned that the fully outfitted facility will be completed in the first half of 1982. The second basic industrial installation will be shipped, completely outfitted, by USSR Minkhimmash. Shipping of the equipment for it is to be completed in the full amount during the second quarter of 1983.

In order to raise further the level of industrialization of the construction work, the general designer--Lengiproneftekhim [Leningrad State Institute for the Design of Petrochemical Enterprises]--tried, while preparing the technical papers, to utilize prefabricated structure and components, and also the experience gained in erecting the refinery's first line, to the maximum. This will enable construction and installing organizations to work at a rapid pace, enabling production capacity that was planned for the 11th Five-Year Plan to be put into operation by the established deadline.

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## BRIEFS

FLOATING DRILL RIG OPERATES--The first offshore rotating-duty detachment on the new floating drill rig, "60 let Azerbaydzhana," which has risen up in the Andreyev Bank area, has started work. The day before yesterday the drillers' collective here under Valeriy Sadykhov and drilling foreman Zakir Garibov undertook the penetration of exploratory hole No 4, which has a designed depth of 6,500 meters. The new drill rig was sited 15 km to the southeast of the first prospecting hole, which was drilled in this area 3 years ago. Right now four floating drill rigs are prospecting simultaneously various parts of the Caspian for new oil and gas deposits. Drillers from the PBU [floating drill rig] "Baku" are operating successfully under Ali Ismaylov and drilling foremen Viktor Artyumov and Natik Khalikov. Recently, while drilling hole No 57, which is sited in the Bulla-More area, for the first time offshore they lowered intermediate casing 508 mm in diameter satisfactorily to a depth of 1,410 meters. The condition of the wellbore and treatment of the mud with highly effective chemical reactants helped much here. The drillers fulfilled the task for the first 5 months of the year ahead of time. And the collective of the PBU "Khazar" is penetrating hole No 1 at the new Exploratory Structure imeni Fuad Samedov at high speed. The explorers of the earth's depths sent the bottom hole to 5,664 meters ahead of schedule, and intermediate casing has been lowered to this depth. The drillers are consumed by one thought, one striving--to be more rapid in exploring and in placing the rich stores of natural fuel at the motherland's service. [By O. Selimkhanov, chief of the Technical Operations Section of Kaspburneftegazprom [Caspian Drilling Trust of the Oil and Gas Industry] [Text] [Baku VYSHKA in Russian 31 May 81 p 1] 11409

TATARIA OIL-RECOVERY MILESTONE--Kazan'. This year the penetrators of Tataria's underground depths will recover their 2-billionth ton of crude since the day of the field's discovery. This amount will be obtained for one region of our country for the first time. It is noteworthy that 28 years were taken to recover the first billion tons, 10 years to recover the second billion. Socialist competition for the honorary right to recover the milestone ton of "black gold" is being expanded in the laboring collectives of the oil and gas recovery administrations and drilling enterprises. Many oilfield workers and hole-drillers have carried out increased commitments well ahead of schedule. Among the competition leaders are the collectives of oil-recovery workers of Al'met'yevneft' [Al'met'yevsk Oil Production Association] that foremen Sh. Khabibullin and Kh. Shamsullin supervise. [V. Goncharov] [Text] [Moscow SEL'SKAYA ZHIZN' in Russian 30 May 81 p 1] 11409

SUMY GAS INJECTION--Sumy. A new method introduced into domestic practice for the first time by recovery workers of Ukrgazprom [All-Union Industrial Association of

the Ukrainian Gas Industry] will help to obtain half a million more tons of gas condensate at the Novotroitsk field in Sumskaya Oblast. The erection of a high-powered installation for pumping gas into the depths has been completed, which will enable the pressure within the formation to be stabilized. Right now more than half of our republic's gas fields are saturated with heavy hydrocarbons. And although they are very valuable for producing gasoline, diesel fuel, flotation reactants, varnishes and paints, and other products of the chemical and petrochemical industries, recovering this product is very difficult. During the withdrawal of gas, when the reservoir pressure drops, the condensate is precipitated out, remaining practically inaccessible to the oilfield workers for the time being. The new method was called upon precisely to help solve this problem. Its essence consists in returning the gas that has been raised from the depths, after drying and the extraction of heavy hydrogens [as published], to the formation through injection holes. Specialists estimate that,with repeat withdrawal of the gas, condensate recovery will increase from 50 to 70 percent. [Text] [Kiev PRAVDA UKRAINY in Russian 29 May 81 p 2] 11409

POKROVKA CASING-HEAD GAS--The flaming torches at the Pokrovka field (Orenburgskaya Oblast] have been extinguished. Millions of cubic meters of casing-head gas will now be used in the national economy. [Text] [Moscow EKONOMICHESKAYA GAZETA in Russian No 22, May 81 p 6] 11409

GEORGIAN OIL PIPELINE--A new oil pipeline has been laid from Samgori to Batumi. Georgian oil will come to Batumi, bypassing rail transport. Builders of the Rostov, Groznyy and Krasnodar trusts of Yuzhtruboprovod [Main Administration for Pipeline Construction in the Southern Economic Region] of the USSR Ministry of Construction of Petroleum and Gas Industry Enterprises. Helicopters were used during construction in areas difficult of access, and the important arterial was laid in all kinds of weather. [Text] [Baku VYSHKA in Russian 19 May 81 p 2] 11409

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